

WHAT IS CLAIMED IS:

1 1. A current-perpendicular-to-the-plane structure magnetoresistive
2 element comprising:

3 an electrically-conductive free magnetic layer;

4 an electrically-conductive pinned magnetic layer;

5 an electrically-conductive non-magnetic intermediate layer interposed
6 between said free and pinned magnetic layers;

7 a primary electrode layer made of an electrically-conductive material;

8 a smaller electrode layer made of an electrically-conductive material
9 and interposed between said free magnetic layer and said primary electrode layer; and

10 a domain controlling film made of an insulating magnetic material and
11 disposed adjacent to said smaller electrode layer between said free magnetic layer and
12 said primary electrode layer.

1 2. The current-perpendicular-to-the-plane structure magnetoresistive
2 element according to claim 1, wherein said domain controlling film is disposed adjacent
3 to a rear surface of said smaller electrode layer, a front surface of the smaller electrode
4 layer facing an air bearing surface of a head slider.

1 3. The current-perpendicular-to-the-plane structure magnetoresistive
2 element according to claim 1, wherein said domain controlling film further comprises:
3 a pair of first bodies disposed adjacent to an air bearing surface of a
4 head slider so as to interpose said smaller electrode layer therebetween; and
5 a second body disposed adjacent to rear surfaces of said smaller
6 electrode layer and said first bodies, front surfaces of the electrode layer and the first
7 bodies facing said air bearing surface.

1 4. The current-perpendicular-to-the-plane structure magnetoresistive
2 element according to any of claims 1-3, wherein said domain controlling layer is made
3 of an antiferromagnetic layer.

1 5. A current-perpendicular-to-the-plane structure magnetoresistive
2 element comprising:
3 an electrically-conductive free magnetic layer;
4 an electrically-conductive pinned magnetic layer;
5 an electrically-conductive non-magnetic intermediate layer interposed
6 between said free and pinned magnetic layers;
7 a primary electrode layer made of an electrically-conductive material;

8 a smaller electrode layer made of an electrically-conductive material
9 and interposed between said free magnetic layer and said primary electrode layer;
10 a domain controlling film made of a magnetic material and disposed
11 adjacent to said smaller electrode layer, said domain controlling film contacting said
12 free magnetic layer; and
13 an insulating layer disposed between said domain controlling film and
14 said primary electrode layer.

1 6. The current-perpendicular-to-the-plane structure magnetoresistive
2 element according to claim 5, wherein said domain controlling film is disposed adjacent
3 to a rear surface of said smaller electrode layer which faces a front surface of an air
4 bearing surface of a head slider.

1 7. The current-perpendicular-to-the-plane structure magnetoresistive
2 element according to claim 5, wherein said domain controlling film further comprises:
3 a pair of first bodies disposed adjacent to an air bearing surface of a
4 head slider so as to interpose said smaller electrode layer therebetween; and
5 a second body disposed adjacent to a rear surface of said smaller
6 electrode layer and said first bodies which face front surfaces of said air bearing surface.

1 8. A current-perpendicular-to-the-plane structure magnetoresistive
2 element comprising:
3 an electrically-conductive free magnetic layer;
4 an electrically-conductive pinned magnetic layer;
5 an electrically-conductive non-magnetic intermediate layer interposed
6 between said free and pinned magnetic layers;
7 a first electrode layer made of an electrically-conductive material;
8 a second electrode layer made of an electrically-conductive material
9 and interposed between said free magnetic layer and said first electrode layer; and
10 a domain controlling film made of an insulating magnetic material and
11 disposed adjacent to said second electrode layer between said free magnetic layer and
12 said first electrode layer,
13 wherein a surface of said second electrode layer contacts a surface of
14 said first electrode layer and has a surface area smaller than a surface area of said first
15 electrode layer.

1 9. The current-perpendicular-to-the-plane structure
2 magnetoresistive element of claim 8, wherein said domain controlling film is disposed
3 adjacent to only one side of said second electrode layer.

1 10. The current-perpendicular-to-the-plane structure
2 magnetoresistive element of claim 8, wherein said domain controlling film is disposed
3 adjacent to only two sides of said second electrode layer.

1 11. The current-perpendicular-to-the-plane structure
2 magnetoresistive element of claim 8, wherein said domain controlling film is disposed
3 adjacent to at least three sides of said second electrode layer.

1 12. The current-perpendicular-to-the-plane structure
2 magnetoresistive element of claim 8, wherein said domain controlling film comprises at
3 least two separate portions separated by said second electrode layer.